

REMARKS

Although the Office Action Summary indicates that all, i.e., claims 1 – 33, stand rejected, there is no reference to the status claim 24 in the Detailed Action. If the Examiner's intention was to address the subject matter of claim 24 along with that of claim 3, then a corrected Office Action is requested. It is further noted that, although claim 9 is addressed at page 9 of the Office Action, that claim is not included in the listing of claims rejected at page 8 and that basis for the rejection of claim 23 appearing in the paragraph spanning pages 8 and 9 is inapplicable to the language of that claim. Again, clarification or correction is requested.

The claims are amended to more clearly describe the subject matter of the invention without prejudice to, disclaimer or surrender of Applicant's right to submit claims of the same or broader scope than originally filed or any other claims supported by the disclosure in a continuation application. Thus, to advance prosecution, the pending claims are amended to require that generating of the high intensity electric field by the corona electrodes be interrupted or otherwise be discontinuous with the step wherein those electrodes are heated. Claim 8 is cancelled, the subject matter thereof having been incorporated into independent claim 1. Claims 5 and 6 are cancelled, the features recite therein having been directed to alternative embodiments to those to which claim 8 had been directed.

A feature of the invention directed to the mitigation of oxidation of a corona electrode as described in the original disclosure at, for examples, paragraph 25 et seq., and original claim 9 is emphasized in the language of amended claim 18 and new claim 36. New claims 35 – 37 further specify that the high intensity electric field be present in an immediate vicinity of an ionizing edge of said corona electrode. Support for this language can be found in the original disclosure including the prior related patent applications incorporated by reference, e.g., U.S. Patent Application Serial No. 10/352,193 filed by Applicant on January 28, 2003:

It should be noted that a corona discharge takes place at the narrow area of the corona electrode, these narrow areas termed here as "ionizing edges".

U.S. Patent Application Serial No. 10/352,193 at paragraph [0014].

In particular, the pending independent claims require that:

...said steps of producing a high intensity electric field and heating do not overlap.

(Claim 1);

interrupting application of a high voltage to at least a portion of said corona electrodes so as to terminate said step of producing said high-intensity electric field with regard to that portion of corona electrodes;

applying a heating current to said portion of said corona electrodes sufficient to raise a temperature thereof resulting in at least partial elimination of an oxide formed on said portion of said corona electrodes;

(Claim 18);

c. control circuitry for alternatively applying said high voltage power supply and low voltage power supply to said corona electrodes.

(Claim 22);

interrupting said step of generating said high intensity electric field in a vicinity of a corona electrode;

(Claim 32); and

temporarily reducing an intensity of said high-intensity electric field to suspend said generation of said ionic wind;

heating the corona electrodes to a temperature sufficient to mitigate an undesirable effect of an impurity formed on said corona electrode while said generation of said ionic wind is suspended...

(Claim 38).

Rejections of Independent Claims 1, 18, 22 and 32

Claims 1 and 22 stand rejected as anticipated by Sakakibara, Morita and Noguchi, while claims 18, 22 and 32 stand rejected as being obvious over Morita in combination with the other art of record.

Sakakibara's disclosure (JP 60-114363), one of the references relied upon for the rejection of claim 1 (and claim 4 dependent therefrom) includes simultaneously producing an ionic induced fluid flow AND heating of a corona electrode. Distinct from Applicant's teachings

of heating the electrode to mitigate a contaminant (e.g., oxide) formed on the electrode, the prior art is directed to reducing the generation of ozone during device operation, i.e., while an ionic wind is being generated. Thus, the prior art describes simultaneous generation of a corona discharge **and** electrode heating to minimize ozone generation, not the separate and distinct performance of these operations as required by the pending claims. To the contrary, modifying the applied references to include such a feature would render the devices described therein inoperative for their intended use in reducing ozone production as a result of and during corona discharge operations and ionic wind production. While Morita does mention heating an ozonating element 60 even after power to the element is shut off, this is only to prevent dew condensation on the element by maintaining a temperature of 40° C (104° F), well below that required by Applicant's invention.

Heating of corona electrodes while simultaneously generating an ionic wind raises several problems. For example, the ionic wind generated during normal operations cools the corona wires so that the resultant heat loss necessitates use of an increased current to heat the corona wires to a sufficiently high temperature. Second, the simultaneous application of both a high voltage and heat greatly accelerates adverse chemical reactions including wire material oxidation and deposition of chemical materials onto the electrode surface. A third problem associated with simultaneous heating and corona discharge operations is due, at least in part, to the use of relatively thin wire corona electrodes taught by the prior art references. These wires, upon being heated, expand, lengthen and, as a result, sag. The sagging wires tend to oscillate and/or be attracted and move toward the opposite electrode under the influence of electrostatic forces and sparking. Recognizing these problems, the pending claims are directed to heating corona electrodes (e.g., corona wires) **in the absence** of an ionic wind, i.e. with high voltage between the electrodes being removed or reduced to the level below the corona onset level (e.g., to a power level substantially equal or close to zero).

Noguchi (4,689,056) teaches **simultaneous** ionic wind generation and heating the corona electrodes to reduce ozone. Neither Sakakibara (JP 60-114363) nor Morita (6,039,816) teach ionic wind generation at all and therefore further fail to describe or suggest separate, non-

overlapping steps of ionic wind generation and electrode heating as required by the pending claims.

In connection with claim 32, the Examiner takes the position Rodden teaches suppressing ozone production by heating the electrodes to a temperature sufficient to substantially restore the converted part of corona electrodes. The basis for this position is unclear and clarification is requested particularly since it is Applicant's understanding that the opposite must result. That is, if corona discharge and heating are performed simultaneously the oxidation of the corona electrode metal is greatly accelerated not mitigated. Thus, contrary to any teachings of the applied art, material restoration is optimized and possibly only practical by heating in the absence of the corona discharge.

Accordingly, for the reasons presented, the subject matter of independent claims 1, 18, 22, 32 and 38 is considered to be patentably distinguishable and allowable over the applied art. Withdrawal of the outstanding rejections of those claims is respectfully requested.

Rejections of the Dependent Claims 2 - 17, 19 – 21, 23, 25-31 and 33

Dependent claims 2 - 17, 19 – 21, 23, 25-31 and 33 are considered to be allowable both as dependent from the allowable subject matter of their respective base claims and as reciting additional features of the invention not shown or rendered obvious by the applied art. For example, claim 2 stands rejected as being obvious over the combination of Sakakibara and Yu (5,469,242). However, contrary to the Examiner's assertions, Yu does not teach silver and cadmium and does not teach an application of these materials in the corona electrodes themselves. Yu instead describes application of lead and zinc to the surface of a shield surrounding the corona wire. The Examiner's position that the application of easily oxidized materials is obvious so as to reduce ozone production by converting part of this material into material oxide finds no support in the applied references. Likewise, there is no basis to render obvious a reversed conversion of these oxides to the original metal by applying substantial heat to the material. Similar rationale applies to claim 22 which, together with claim 2, are both considered to be allowable for the reasons presented.

Likewise, Morita fails to render obvious the subject matter of claim 3, failing to describe or suggest anything concerning oxidation and de-oxidation.

In connection with the rejection of claim 7 as anticipated by Morita, the reference falls short, failing to teach ionic wind generation. The reference also fails to address oxidation, the subject matter to which claim 9 is directed.

Claim 10 as amended requires “a step of monitoring the electrical characteristics of said corona electrode”. In contrast, Morita describes only providing an “indication of a condition of said corona electrodes”, i.e., detecting a chemical deposit ON the corona wire. This chemical deposit, however, does not change the electrical characteristics of the corona electrode itself. Thus, Morita fails to anticipate or render obvious the subject matter of claim 10 or claims 11 and 12 dependent therefrom. By similar rationale, claims 13 – 17 are likewise considered to be patentably distinguishable over Morita.

Claim 18 requires “detecting an electrical characteristics of said corona electrodes indicative of initiation of a corona electrode deoxidation cycle...” Morita again falls short, failing to describe detection of an electrical characteristics of the corona electrode itself or application of an electrical current to the corona electrode. Claims 19 – 21, dependent from claim 18, are considered to be patentably distinguishable over Morita for similar reasons.

Claims 25 – 28 are considered to be allowable for the reasons presented infra in connection with claim 18.

Addressing claims 29, Morita does not describe or suggest use of a low voltage power supply configured to supply a controlled magnitude of electric power to said corona electrode. Referring to the disclosure at column 16, lines 18-28 together with Figure 11, Morita explicitly depicts and describes a non-controlled half-wave rectifier that supplies a voltage (not power) to the heater (not the electrode itself). Note that such a circuit cannot be used to address electrode oxidation that causes an increase in electrode resistance. This is because a half wave rectifier does not accumulate and discharge a controlled amount of electromagnetic energy. For similar reasons, claims 30 and 31 are considered to be allowable.

Conclusion

In view of the above amendment, applicant believes the pending application is in condition for allowance.

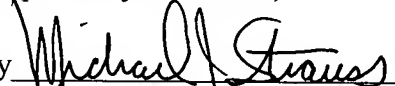
A check in the amount of \$600.00 is enclosed for the following:

- a) Petition for a One-Month Extension of Time (\$120);
- b) Information Disclosure Statement after the first Office Action (\$180) and
- c) Two (2) extra claims (\$100) w/ One (1) extra Independent claim (\$200).

If any other or additional fee is due, please charge our Deposit Account No. 06-2375, under Order No. 432.010 from which the undersigned is authorized to draw.

Dated: October 24, 2005

Respectfully submitted,

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